Fig.1

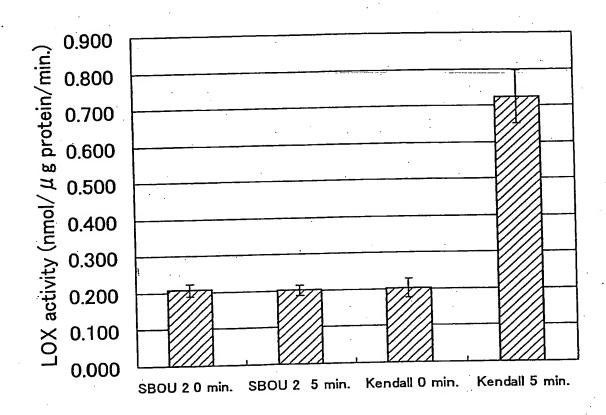


Fig.2

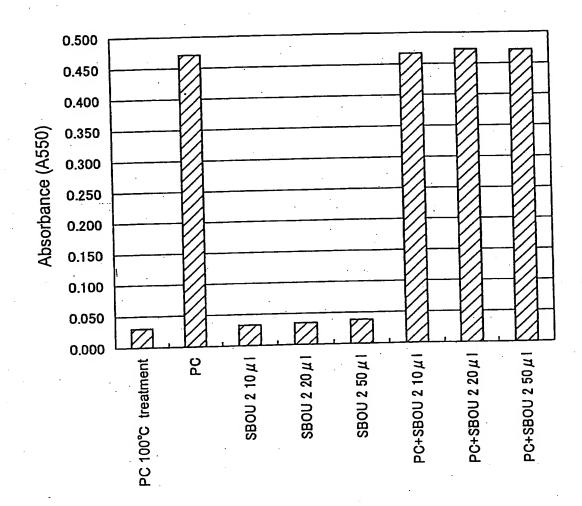


Fig.3

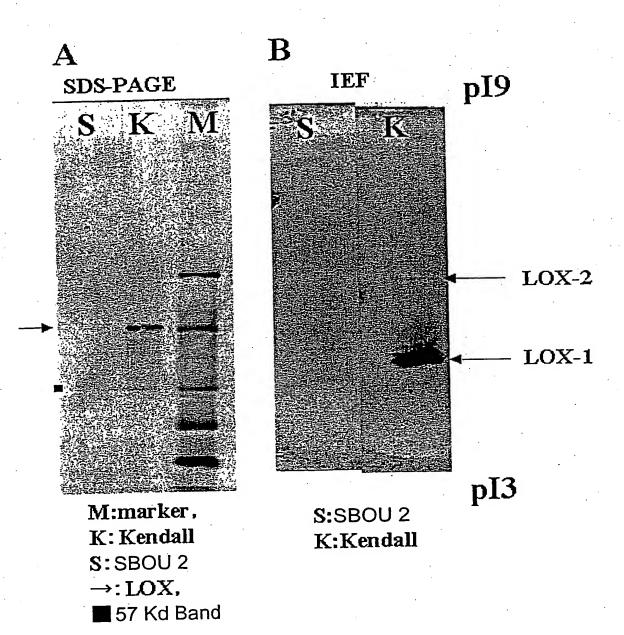
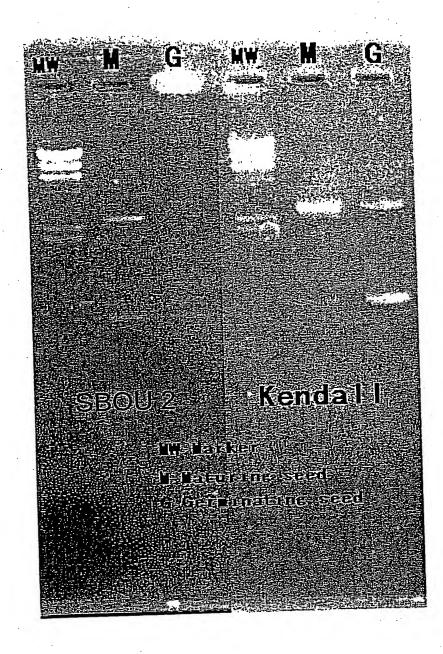


Fig.4



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Vintage TCCGGGTGGCACCAGCTCAGCCACTGGTACGTTCTCCACGGTCGATGTGATTCAGTC SerGlyTrpHisGlnLeuValSerHis 5th intron Loss of Afal/Rsal site AfaI/Rsa

TCCGGGTGGCACCAGCTCGTCAGCCACTGATACGTTCTCCACGGTCGATGTGATTCAGTC SBOU 2

SerGlyTrpHisGlnLeuValSerHis\*\*\*

Stop codon

Nucleotide sequences of LOX-1 gene, the regions of 5th intron splicing donor site

Fig.5

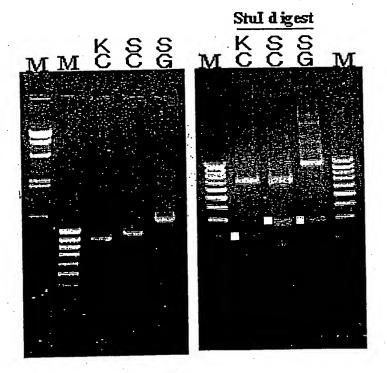
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Fig.6

 $\mathbf{A}$  B



M: Marker,

KC: Kendall cDNA template

SC: SBOU 2 cDNA template

SG: SBOU 2 genomicDNA template

Fig.7

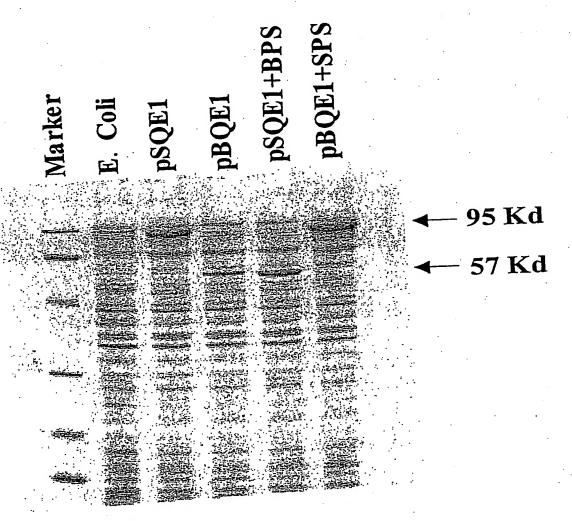
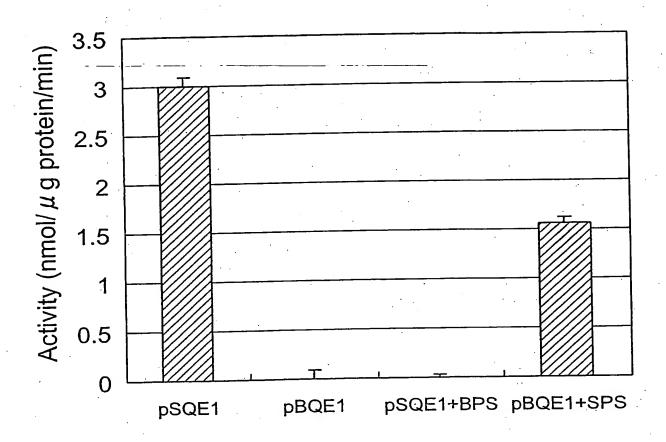


Fig.8

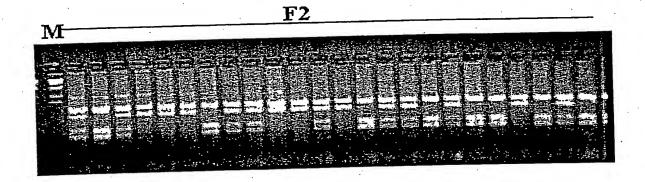


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Fig.9



M:Marker

F2: Kendall x SBOU 2 F2 DNA Afal method analysis

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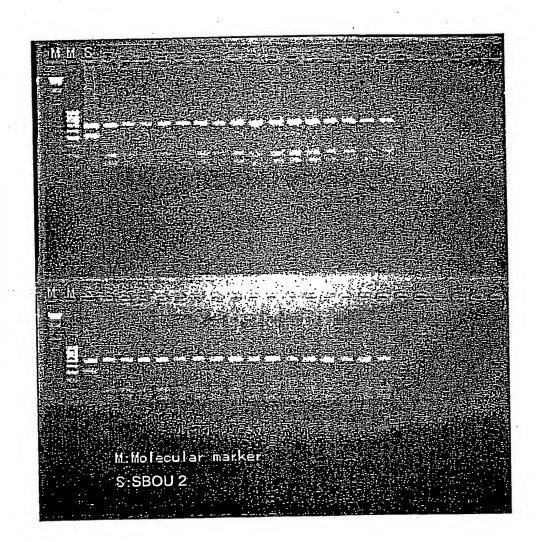
Fig.10

F2 individual No.   LOX activity   Afail method   JBC970   F2 individual No.   LOX activity   Afail method   LOX activity	JBC970 サザン KB KB KK KB KK BB KB BB KB BB KB BB KB BB KK KK
CAPS   779	(B) (B) (K) (C) (B) (B) (B) (B) (B) (B) (C) (B) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C
1	(日本) (日本) (日本) (日本) (日本) (日本) (日本) (日本)
2 + KK KK KK	88 88 88 88 88 88 88 88 88 88 88 88 88
3 + KB KB	(B) (K) (B) (B) (B) (B) (B) (B) (C) (B) (B) (C) (B) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C
4 - BB KB - 77 + KK	KK   BB   BB   KK   KK   KK   BB   BB
5 - BB BB BB 78 - BB 6 - BB BB BB 78 - BB 7 + KK KK KK 79 + KB 8 + KB KB BB	BB
6 - BB BB BB 76 FB	KB BB KK KK KK BB BB
7 + KK KK KK BB	BB
8         +         KB         KB         BB         BB <td>BB KB KK KK KK BB</td>	BB KB KK KK KK BB
9	KB KK KK BB BB
10 - BB BB KB BB KB BA + KK  111 - BB KB KB BA + KK  112 + KB KB BB	KK KK BB BB
111 - BB KB BB	88 88
12 + KB	88
13 - BB	
14       +       KR       KR       87       -       BB         15       +       KB       KB       BB       +       KB         16       +       KB       KB       BB       +       KB         17       +       KK       KK       KK       BB       -       BB         18       +       KB       KB       90       -       BB         18       +       KB       KK       KK       BB       -       BB         19       +       KK       KK       KK       BI       -       BB       KK         20       +       KK       KK       KK       BB       -       KB       KB       BB       +       KK       KK       KB       BB       +       KB       KB       BB       +       KB       BB       BB       BB<	BB
15	
17 + KK KK S S S S S S S S S S S S S S S S	KB
18 + KB KB 90 - BB 19 + KK KK KK 91 + KK 20 + KK KK KK 92 + KB 21 - BB KB 93 + KB 21 - BB KB 93 + KB 22 + KK KK 94 + KK 23 + KB KB 85 + KB 24 + KK KK 96 + KB 25 + KB KB 96 + KB 26 + KB KB 98 + KB 27 + KK KK 99 + KB 28 + KK KK 99 + KB 29 + KK KK 100 + KB 29 + KK KK 101 - BB 30 + KB KB 102 + KB 31 + KB KB 103 + KB 31 + KB KB 105 + KB 33 + KB KB 106 + KK 35 + KK KK 107 + KB	BB
19 + KK KK SK 92 + KB 20 + KK KK SK 92 + KB 21 - BB KB 93 + KB 21 - BB KB 93 + KB 22 + KK KK SB SS + KB 23 + KB KB SS + KB 23 + KB KB SS + KB 24 + KK KK SS SS + KB 25 + KB KB SS SS + KB 26 + KB KB SS SS + KB 27 + KK KK SS	BB
20 + KK KK 92 + KB 21 - BB KB 93 + KB 22 + KK KK 94 + KK 22 + KK KK 94 + KB 23 + KB KB 96 + KB 24 + KK KK 96 + KB 25 + KB KB 97 + KK 26 + KB KB 97 + KK 26 + KB KB 98 + KB 27 + KK KK 99 + KB 28 + KK KK 100 + KB 29 + KK KK 101 - BB 30 + KB KB 102 + KB 31 + KB KB 103 + KB 31 + KB KB 103 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 107 + KB 35 + KK KK 107 + BB 36 + KB KB 107 + KB 37 + KB KB 108 + KB 38 + KK KB 107 + KB	KK_
21 - BB KB 93 + KB  22 + KK KK KK 94 + KK  23 + KB KB 85 + KB  24 + KK KK 86 96 + KB  25 + KB KB 97 + KK  25 + KB KB 98 + KB  26 + KB KB 98 + KB  27 + KK KK 86 99 + KB  28 + KK KK 100 + KB  29 + KK KK 100 + KB  30 + KB KB 102 + KB  31 + KB KB 103 + KB  32 - BB KB 103 + KB  33 + KB KB 105 + KB  33 + KB KB 106 + KK  33 + KB KB 107 + KB  33 + KB KB 106 + KK  33 + KB KB 106 + KK  33 + KB KB 106 + KK  35 + KK KB 107 + KB	<u>KB</u>
22 + KK KK 94 + KK 23 + KB KB 96 + KB 24 + KK KK 96 + KB 25 + KB KB 97 + KK 25 + KB KB 98 + KB 26 + KB KB 98 + KB 27 + KK KK 99 + KB 28 + KK KK 100 + KB 29 + KK KK 100 + KB 30 + KB KB 102 + KB 30 + KB KB 103 + KB 31 + KB KB 103 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 33 + KB KB 106 + KK 35 + KK KK 107 + KB 36 + KB KB 106 + KK 37 + KB KB 107 + KK 38 + KK KB 107 + KK 39 + KB KB 108 + KK 31 + KB KB 109 + KB	<u>KB</u>
23 + KB KB B5 + KB 24 + KK KK B6 + KB 24 + KK KK B6 + KB 25 + KB KB B7 + KK 26 + KB KB B98 + KB 27 + KK KK B99 + KB 28 + KK KK B99 + KB 29 + KK KK B100 + KB 29 + KK KK B100 + KB 30 + KB KB B103 + KB 31 + KB KB B103 + KB 31 + KB KB B103 + KB 32 - BB KB B103 + KB 33 + KB KB B105 + KB 33 + KB KB B105 + KB 34 + KB KB B105 + KK 35 + KK KB B106 + KK 35 + KK KB B107 + KK 36 + KB KB B107 + KK 37 + KB KB B108 + KK 38 + KK KB B109 + KK 39 + KB KB B109 + KB 39 + KB KB B109 + KB	KK KB
24 + KK KK BB F KB BT KB BB F KB BB BB BB BB F KB BB	KB
25 + KB KB 98 + KB 26 + KB KB 98 + KB 27 + KK KK 99 + KB 28 + KK KK 100 + KB 29 + KK KK 101 - BB 30 + KB KB 102 + KB 31 + KB KB 102 + KB 31 + KB KB 103 + KB 32 - BB KB 104 + KB 32 - BB KB 105 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 106 + KK 35 + KK KB 107 + KK 36 + KB KB 107 + KK 37 + KB KB 108 + KK 38 + KK KB 107 + KK 38 + KB 108 + KK 39 + KB KB 109 + KB	KK
26         +         KB         KB         98         +         KB           27         +         KK         KK         99         +         KB           28         +         KK         KK         100         +         KB           29         +         KK         KK         101         -         BB           30         +         KB         KB         102         +         KB           31         +         KB         KB         103         +         KB           32         -         BB         KB         104         +         KB           33         +         KB         KB         105         +         KB           34         +         KB         KB         106         +         KK           35         +         KK         KB         107         +         KK           36         +         KB         KB         108         +         KB           37         +         KB         KB         109         +         KB           38         +         KK         KK         110         -         BB	KB
27 + KK KK 55 28 + KK KK 100 + KB 29 + KK KK 101 - BB 30 + KB KB 102 + KB 31 + KB KB 103 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 107 + KK 35 + KK KB 107 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 38 + KK KK KK 110 - BB 39 + KB TD - BB	KB
28 + KK KK 101 - BB 29 + KK KK 101 - BB 30 + KB KB 102 + KB 31 + KB KB 103 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 106 + KK 35 + KK KB 107 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 108 + KK 38 + KK KB 109 + KB 38 + KK KK 110 - BB 39 + KB - 111 - BB	KB
29 + KK KK 1012 + KB 30 + KB KB 102 + KB 31 + KB KB 103 + KB 31 + KB KB 104 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 34 + KB KB 106 + KK 35 + KK KB 107 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 38 + KK KK 110 - BB 39 + KB - 111 - BB	BB
30 + KB KB 103 + KB 31 + KB KB 104 + KB 32 - BB KB 104 + KB 33 + KB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 106 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 37 + KB KB 109 + KB 38 + KK KK KK 110 - BB 38 + KK KK KK 110 - BB	KK
31 + KB KB 104 + KB 32 - BB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 106 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 37 + KB KB 109 + KB 38 + KK KK KK 110 - BB 38 + KK KK KK 110 - BB	KB
32 - BB KB 105 + KB 33 + KB KB 106 + KK 34 + KB KB 107 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 37 + KB KB 110 - BB 38 + KK KK KK 110 - BB 39 + KB - 111 - BB	КВ
33 + KB KB 106 + KK 34 + KB KB 107 + KK 35 + KK KB 107 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 38 + KK KK 110 - BB 38 + KK KK 110 - BB	KB
35 + KK KB 1071 + KK 36 + KB KB 108 + KK 37 + KB KB 109 + KB 38 + KK KK 110 - BB 38 + KK KK 1110 - BB 39 + KB 1111 - BB	KK
35 + KB KB 108 + KK 36 + KB KB 109 + KB 37 + KB KB 110 - BB 38 + KK KK 1110 - BB 39 + KB - 1111 - BB	KK_
37 + KB KB 109 + KB 37 + KK KK 110 - BB 38 + KB - 111 - BB 39 + KB - 112 + KB	KK
38 + KK KK 110 - 88 39 + K8 - 111 - 88 39 + K8 - 112 + K8	KB_
39 + KB - 111 - BB	BB_
112 T NB	BB
1 401 1 1 KH	KB_
A11 - BB BB BB	KB KB
40 ± KB KB 114 ± NS	BB
A2 + KK KK 115	KB
44 + KB KB 116 T	BB
AS BB BB	KK
46 + KK KK	KB
47 - BB BB KK	КК
48 + KK KB 121 + KB	KB
49 + KB KB 122 + KB	КВ
50 - BB BB BB 123 + KK	KK
51 + KB KB	KB
52 + 125 - 88	BB
53 + N BB 126 + KK	KK_
54 - BB KK 127 + KB	KB_
55 + KK N 128 + KB	
56 - KB 129 + KB	BB
50 ± KB KB 130 + KB	KB
50 - BB BB 131 + KK	KB KB
55 - BB BB 132 + KK	KB KB KB
61 + KK KK 133 - BB	KB KB
CO + KK KK 134 - BB	KB KB KB KK BB
02 + KK KK 135 + KK	KB KB KD KK BB
63 + KB KB 136 + KB	KB KB KB KK BB BB
65 + KB KB 137 + KB	KB KB KB KK BB KK KK KB
66 + KK KK 138 + NB	KB KB KB KK BB BB KK KB
67 + KB KB 139 - 55	KB KB KB KK K
68 + KK KK 140 + KB	KB KB KB KC BB BB KK KK KB KC KB
69 + KB KB 141 + NB	KB KB KK KK
70 - BB BB 142 T NS	KB   KB   KB   KB   KK   KB   KK
71 + KB KB 144 + KB	田
72 - BB BB 144 + NS	KB   KB   KB   KB   KK   KB   KK

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Fig.11

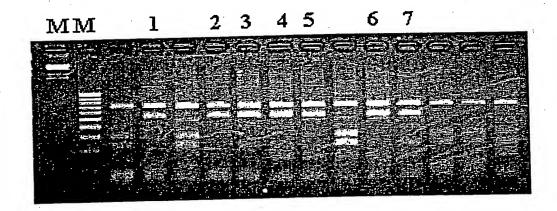


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Fig.12



M: Marker, 1 and 5:SBOU2、2:SBOU 5、3:SBOU 6 4:SBOU 1、6:SBOU 3、7:SBOU 4

Fig.13A

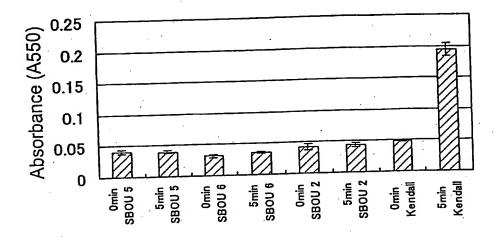
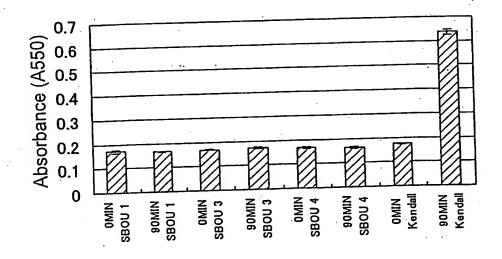


Fig.13B



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## Fig.14

Variety	LOX+F4	LOX-F4
Barley moisture content (%)	10.9	11
Barley weight (g)	3000 -	3000
Steeping (%)	44.8	44.5
Steeping time (h)	82	82
Malt yield weight (g)	2571.6	2572.2
Malt yield percent (%ad)	85.7	85.7
Malt yield percent (%db)	90.3	90.7
Moisture content (%)	6.1	5.8
Mashing time (min)	9-15	9-15
Lautering speed (min)	8	17
Transparency	2	2
Color (EBC)	2.1	2.2
Boiling color (EBC)	3.2	3.3
Air-dried extract (%)	67	69.3
Anhydrous extract (%)	71.4	73.5
TN (%)	2.49	2.291
SN (%)	0.648	0.645
Crude protein (%)	15.6.	14.3
KZ	26	28.1
EVG (%)	78.8	79
DP (*WK)	348	377
DP (WK/TN)	140	165
Viscosity (mPa·s)	1.87	1.89
β-glucan (mg/l)	427	392
pH	5.97	6
Extract yield (%)	64.5	66.7

Fig.15

